A.D. 1855 . . . . N° 2532.

Electric Telegraphs.

LETTERS PATENT to Alfred Vincent Newton, of the Office for Patents, 66, Chancery Lane, in the County of Middlesex, Mechanical Draughtsman, for the Invention of "IMPROVEMENTS IN TRANSMITTING FAC-SIMILE COPIES OF WRITINGS AND DRAWINGS BY MEANS OF ELECTRIC CURRENTS."— A communication from Giovanni Caselli, of Florence.

Sealed the 18th April 1856, and dated the 10th November 1855.

PROVISIONAL SPECIFICATION left by the said Alfred Vincent Newton at the Office of the Commissioners of Patents, with his Petition, on the 10th November 1855.

I, ALFRED VINCENT NEWTON, of the Office for Patents, 66, Chancery Lane, in the County of Middlesex, Mechanical Draughtsman, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN TRANSMITTING FAC-SIMILE COPIES OF WRITINGS AND DRAWINGS BY MEANS OF ELECTRIC CURRENTS" to be as follows:—

The object of this Invention is to transmit with great rapidity through the medium of telegraphic wires fac-simile copies of hand-writing and drawings. For this purpose, the stations which are intended to transmit and receive these telegraphic communications are each provided with apparatus of the like construction, which is brought into connection with a main line wire, and capable of receiving and passing electric currents derived from the main battery. The principle on which fac-simile copies of messages may be produced through the medium of the electric current is well known; but it is rapidity of transmission that is required to render this principle of practical value, and it is to attain this end that the apparatus which forms the subject

of the present Invention has been designed. This apparatus consists mainly of a metal pendulum, which plays between two fixed soft iron armatures. The pendulum carries an insulated electro-magnet, which receives a current of electricity from a local battery when in metallic connection therewith, at which time it is attracted by one or other of the fixed armatures (but cannot come in contact therewith). The alternate making and breaking of the circuit will, therefore, keep the pendulum in motion, and the like effect is produced on the apparatus at the other end of the line wire. The breaking of the circuit between the local battery and the electro-magnet is effected through the medium of forked tumblers at the moment the pendulum strikes against a metal stop on the pillar which carries the soft iron armature. The pendulum rod then conducts the current from the main battery to the main line wire, whence it enters the apparatus that is to receive the written message, destroys in like manner the magnetic power of the electro-magnet of that instrument, and thereby allows the two distant pendulums to beat with perfect synchronism. These pendulums are each provided with a traversing point, which works upon a screw shaft mounted in suitable bearings on the pendulum. This screw shaft carries a wheel, which at every beat of the pendulum is struck (by being brought into contact with a projecting finger), and made to turn on its centre, by which means the pointer is caused to traverse the length of the screw shaft.

The object of this contrivance is to cause the pointer to move in new arcs, and so traverse over the whole surface of the written message or picture, which is drawn or written in ink or varnish on chemically prepared paper, and strained on a metal frame or plate connected by a copper wire with the main battery; while, therefore, the pointer moves over the paper the electric circuit will be complete, except when interrupted by the intervention of the lines of writing or drawing. The current of electricity will, therefore, pass to the pendulum of the receiving instrument, and act chemically (as is well understood) upon the prepared paper on the frame of that instrument, ceasing to act only at the moments of interruption above indicated. Thus the color of the paper will be changed, except at the parts corresponding to those of the transmitting paper on which lie the lines of writing or drawing.

To obtain a colored writing in place of writing in black, the conducting wires are so disposed as to reverse the action of the electric current. A bell arrangement is applied to the apparatus to give the requisite warning to the attendant.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said Alfred Vincent Newton in the Great Seal Patent Office on the 10th May 1856.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, Alfred Vincent Newton, of the Office for Patents, 66, Chancery Lane, in the County of Middlesex, Mechanical Draughtsman, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Tenth day of November, in the year of our Lord One thousand eight hundred and fifty-five, in the nineteenth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Alfred Vincent Newton, Her special licence that I, the said Alfred Vincent Newton, my executors, administrators, and assigns, or such others as I, the said Alfred Vincent Newton, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "Improvements in Transmitting Fac-simile Copies of Writings and Drawings by means of Electric Currents," being a communication from Giovanni Caselli, of Florence, upon the condition (amongst others) that I, the said Alfred Vincent Newton, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Alfred Vincent Newton, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement, reference being had to the Drawing hereunto annexed, and to the letters and figures marked thereon (that is to say):—

The object of the Inventor in the construction of this improved telegraph is (as stated by him) to convey with great rapidity the fac-simile of hand-writing and drawing to any distance whatever, or without changing anything in the disposition of telegraphic lines already existing.

The idea of the possibility of constructing an apparatus for this purpose is not new; it runs back to One thousand eight hundred and forty-three, at which

of the present Invention has been designed. This apparatus consists mainly of a metal pendulum, which plays between two fixed soft iron armatures. The pendulum carries an insulated electro-magnet, which receives a current of electricity from a local battery when in metallic connection therewith, at which time it is attracted by one or other of the fixed armatures (but cannot come in contact therewith). The alternate making and breaking of the circuit will, therefore, keep the pendulum in motion, and the like effect is produced on the apparatus at the other end of the line wire. The breaking of the circuit between the local battery and the electro-magnet is effected through the medium of forked tumblers at the moment the pendulum strikes against a metal stop on the pillar which carries the soft iron armature. The pendulum rod then conducts the current from the main battery to the main line wire, whence it enters the apparatus that is to receive the written message, destroys in like manner the magnetic power of the electro-magnet of that instrument, and thereby allows the two distant pendulums to beat with perfect synchronism. These pendulums are each provided with a traversing point, which works upon a screw shaft mounted in suitable bearings on the pendulum. This screw shaft carries a wheel, which at every beat of the pendulum is struck (by being brought into contact with a projecting finger), and made to turn on its centre, by which means the pointer is caused to traverse the length of the screw shaft.

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The object of the Inventor in the construction of this improved telegraph is (as stated by him) to convey with great rapidity the fac-simile of hand-writing and drawing to any distance whatever, or without changing anything in the disposition of telegraphic lines already existing.

The idea of the possibility of constructing an apparatus for this purpose is not new; it runs back to One thousand eight hundred and forty-three, at which

time Mr. Bakwell applied for a Patent for his autographic telegraph; but twelve years have passed, and this Invention has not been definitely adopted by any telegraphic line either in Europe or in America.

The principal barrier to success in a machine of this nature is to obtain a perfect synchronism of motion in the machine which transfers the despatches, and that at the opposite end of the line which receives and fixes them on the paper. It will be seen by the adjoined description of the machine how this difficulty has been surmounted without employing any watch-work, from which in my estimation no good result can be drawn.

One of the principal advantages which this telegraph possesses over others is the rapidity with which despatches can be sent, and this rapidity can be augmented almost indefinitely, as we shall presently see, on account of the dimensions which can be given to the machine.

Description of the Telegraphic Machine, by M. Caselli.

Here is the description of the apparatus, which I have already had made at Florence in my physical cabinet, and which is represented by the annexed Diagram.

a, *b*, is a pendulum of metal one metre in length, which by means of a very delicate pivot is suspended from a vertical marble column K, K^1. The pendulum is provided with a weight *c* of a conical form, which can be raised or lowered to adjust the pendulum to beat seconds. At the lower extremity is fixed at right angles an electro-magnet *d*, which has the form of a rectangular paralellopipedon. This is seen more clearly in Fig 3 (which represents the pendulum in side view), and also in the enlarged view Fig. 11. *e*, e^1, are two soft iron armatures destined to work on the electro-magnet *d*; they are supported by two iron arms *x*, x^1. *i*, Fig. 8, is an electrical relay, whose play will be seen further on; B is a Bunsen battery, the electrical current of which is established by a copper wire, represented in the Diagram (Fig. 1) by a dotted line.

On examining first the route which the current formed by the Bunsen battery follows, it will be seen, that starting from the positive pole it enters the machine by the binding screw 1, passes by the current breaker *f* (see note 1), arrives at the screw 7, enters the relay (Fig. 8), returns to the machine by the binding screw 6, remounts the column K, K^1, to the brass piece *g*, g^1, (see note 2,) runs along the wire *h*, h^1, h^{11}, which winds around the electro-magnet *d*, remounts the pendulum to the point *s*, to which is joined

the twisted copper wire s^1, and finally descends to the binding screw 2, and re-enters the battery B. The copper wire h, h^1, h^{11}, h^{111}, is insulated by means of small ivory rests, which preserve it from contact with the rod of the pendulum. The piece of iron d being thus magnetized by the electrical current, is held by the armature e, which, however, cannot touch it immediately, the same being covered with a thin stratum of gum elastic.

In order to interrupt the current of the battery B (which I will call a local battery), I make use, as will be presently seen, of the current of the telegraphic line from the battery D. Before examining the course of the current from this battery, let us turn our attention to the other parts of the machine.

The wooden bench l, l, (Fig. 1,) supports two metallic cylinders m, m^1, see the sectional elevation Fig. 5. An iron rod o, o^1, o^{11}, jointed at the point b, follows the motions of the pendulum, and with its extremity o draws along a kind of car q, q, all of metal. This car is represented on a larger scale at Fig. 6, and will be presently described. A very fine steel point r, supported by the above car, can rub on the cylinder m, m, when this is carried by the motion of the pendulum in the direction indicated by the red arrow. A sheet of paper p, p, laid on the cylinder m, m, is found between it and the steel point r.

Supposing the current of the telegraphic battery D to start from the pole d (see Fig. 2), it will go through the copper wire (represented in the Drawing by a red line) to the binding screw or button 3 of the machine (Fig. 1), and hence, remounting by the column K, K^1, will cross over the spring a^1, w, and descend by the column, directing itself to the point u, where the wire branches off, one end going to the cylinder m, m, covered with paper (which being a non-conductor of electricity will impede the passage of the current), and the other leading to the relay (Fig. 8). The current entering the relay will traverse the coils of the electro-magnet i, and descending thence to the button q (Fig. 1), will arrive at the point v, where the wire, after having passed by the interruptor z, divides again, the one end being united to the iron bracket arm x^1, which by its isolation stops the current in that direction, and the other connecting with the arm x, which transmits the current by the brass lever i^* to the metallic rod of the pendulum b, a. From the pendulum the current is conducted by a small coil m to the wire, which, descending the column k, k^1, leaves the machine by the button 5, and goes to the line y, y^1, y^{11}, and traversing the battery D (Fig. 2), joins two telegraphic stations.

Since the instrument shewn at Fig. 1 and that at Fig. 2 are precisely similar in their construction, the result is, that the line current arrives at the button 5,

(Fig. 2), continues its course by the column K, K^1, through the rod of the pendulum, &c.; following, in a contrary sense, in the second machine the same direction that it has followed in the first, it arrives at a copper plate P^1, which is plunged into a well, and returns through the ground to the battery D (Fig. 1), and finishes its course. All these departures and returnings of the electric currents are accomplished in an imperceptible fraction of time, and whatever be the distance between the two stations, all the moving parts of the two machines will work simultaneously. It is so that when the parts of the machines will have the position represented in the Drawing, the current of the line must traverse the coils of the relay i (Fig. 8), and of the corresponding one i^1 at the other station.

Observing the construction of these electrical relays (relais), we see that the current carried by the wire indicated by the dotted line runs through the movable lever w, and by the contact piece w^1 (which is of platinum), enters the into the brass square w^{11}, and joins the copper wire w^{111}; but every time the line current conducted by the red wire circulates in the coil, the lower extremity of the iron lever w is attracted by magnetic force, and hence the current of the pile B is broken at the point w^1. In this way the circuits of the local batteries B (Fig. 1), and B (Fig. 2), being at the same time interrupted, the pendulums of the two instruments will no longer be held by the electro-magnets, but both will be put in motion at the same instant, and thus accomplish their oscillation. As soon as the pendulum a, b, leaves the iron bracket arm x, the electric current which passes, as we have seen, through the lever i* will be interrupted, and the piece w of the relais will return to its vertical position. The pendulum proceeding to the right will also detach itself from the contact piece g, but as soon as it will have arrived to touch the point g^1 on the other side, the circuit of the current of the local pile B will be again restored, and the piece of iron d, becoming magnetized, will be attracted by the armature e^1. The same thing will happen for the same reasons in the other machine (Fig. 2). But as soon as both pendulums will have completed the beat, and have touched their respective armatures, again will be opened the passage of the line current of the line through the pendulums, which, becoming instantly deprived of magnetism, will fall again by their gravity towards the armatures on the other side. In this way the oscillation of the two pendulums must be not only continuous, but perfectly synchronous and uniform.

It is easy to see that this synchronism is not dependent upon the velocity naturally belonging to the pendulums, since, if one of them should for some reason be able to arrive an instant before the other, to complete its movement

it would have to stop in contact with its armature until the other pendulum had ended its oscillation, so as to fall again together with it. The currents then of the local piles B (Fig. 1 and 2) supply the force, which, neutralising the friction, assists the oscillation of the pendulums. The line current coming from the battery D regulates these movements, and renders them infallibly synchronical.

To render our description clearer, let us suppose that the paper *p*, *p*, (Fig. 1,) laid on the cylinder *m*, instead of being simply common paper, is paper covered by a thin layer of tin or zinc. On this metallised paper we can write with a pen the despatch to be sent to the other station with ink containing a little nitric acid. In this case we can write with a glass or platinum pen, and even with a gilt pen. On the other cylinder *m* (Fig. 2) is placed a paper *p*, *p*, chemically prepared with a nearly saturated solution of crystalised nitrate of ammonia, with a small quantity of the double cyanide of potassium and iron. This solution is similar to that used in America in the electro-chemical telegraphs.

Now that we have seen how we produce in the two machines the synchronism of the oscillations of the pendulums, let us again carry our attention to the line current of the line which comes from the batteries D, and let us examine its operations while the pendulums are moving detached from any metallic correspondence with the local batteries B. This current, which must establish the communication between the two stations, having arrived from the pole *d* to the button 3, and from that, after having mounted and descended by the column K, K^1, to the point *u*, not being able to continue its course further than the relais on account of the interruption produced by the detaching of the lever i^* from the iron *x*, it follows the wire *u*, u^1, connected to the cylinder *m*, *m*, and traversing the tinned paper *p*, *p*, enters the steel point *r* in the lever *o*, o^1, o^{11}, and from that passes to the rod of the pendulum *b*, *a*, and descending by the column to the button 5, goes by the line wire to the other stations, and enters into the machine (Fig. 2) by the button 5. Here (supposing it to follow the same rod in Fig. 1), after having passed through the pendulum and the rod o^{11}, o^1, *o*, it would traverse the chemical paper *p*, *p*, would come out at the button 3, and traversing the battery D, would direct itself towards the earth, returning through it to the other station. The point *r* (Fig. 2) being invested by the current while the oscillation of the pendulum is continuing, the result is, that the chemical paper is marked by a colored line parallel to the axis of the cylinder *m*, *m*. The machine continues thus acting indefinitely. If nothing else happened, the point *r* would always pass backwards and forward

over the same line on the paper p, p, and this would be the case if the cylinder were to remain stationary; but it moves at every oscillation of the pendulum (as we shall presently see), turning on its axis, moved by a wheel-work, seen in profile in Fig. 1, and in section at Fig. 5. q (Fig. 5) presents the head of an electro-magnet, similar to that shewn in Fig. 11. The double lever o, o^1, carries at its extremity o a piece of soft iron, and on the other a kind of anchor i, i, which holds or lets go the oblique teeth of the escapement wheel r. A cord c, c, wrapped around the barrel n (seen in front view at Fig. 1), carries a weight, which moves all the wheel-work every time the anchor i, i, lets go a tooth of the small wheel r. This happens at every oscillation of the pendulum a, b. At the same time the circuit of the local pile B is closed (as we have seen) to magnetise the electro-magnet of the pendulum; a secondary current is excited in the copper wire, which causes the piece q (Fig. 5) to be magnetised (see note 5), and renders it capable of attracting the iron attached to the extremity of the lever o, o^1. At the interruption of the current the lever is carried back to its horizontal position by the antagonistic spring t, and at the same time another tooth of the escape wheel r is freed by the anchor i, i. The wheel-work is proportioned so that the cylinder m for every double movement of the anchor o, o^1, turns on its axis through the space of a sixth of a millimetre.

Nothing more is necessary in order to understand how, by means of this movement of the cylinders, the same effect occurs at every oscillation of the pendulums. The parallel lines described by the steel point v on the chemical paper will be separated one from another by a distance not greater than the sixth of a millimetre, including the thickness of the lines. It is only necessary to add that the paper is kept in contact with the cylinder m by a pressing roller v. The car q, q, (Figures 1 and 6,) is carried by the rod o, o^1, o^{11}, on a triangular rail of iron, one extremity of which is seen in g, Fig. 5. The point r of the machine (Fig. 1) sliding over the tinned paper leaves no trace; but the point of the other machine must, by the action of the positive pole of the current, trace on the paper colored lines in prussian blue. If we now suppose the ink with which we write the messages on the tinned paper to be a bad conductor of electricity (and common ink has in fact this quality), it is clear that at every character of writing that the point touches in passing there will be interruption of the current of the line, and consequently there will be produced on the chemical or message-receiving paper a multitude of blank spots, which on a ruled coloured ground will be disposed identically with the lines which compose the writing or the drawing in the despatch; and as these blank spots cannot be further apart than a sixth of a millimetre, the eye cannot

distinguish their intervals, and we shall have thus obtained the fac-simile of the original, which is at the other station.

For the full success of the operation nothing is wanting now but to find such a disposition as to reverse the effect of the electricity, so as to obtain (instead of blank characters) a colored writing or drawing. To arrive at this end, we have disposed the parts of the battery as they are seen in Fig. 10. We have united by a copper wire the two poles of the first element *a* of Bunsen's battery *b*, *c*. The red wire *d*, *i*, *e*, *f*, which unites the extremities of the said battery, represents the telegraphic circuit formed by the line wire and the earth. Let us examine what must happen in the conducting wire *k* while the battery is in action. The current starts from the point *g* to render itself to the other pole *h*, but having arrived at the point *i* it is divided in two, and one of the arrived currents, following the direction pointed out by the red arrow, will produce it in the blue wire *k*; but the galvanic element *a*, having its own current, sends a part of it by the wire *k*, following the direction of the black arrow, and the other part is lost in the principal circuit. We thus have two currents in opposite directions in the same wire *k*. If by means of a reostat we maintain the two contrary currents at the same force, it is clear that no electrical effect can be produced in the wire *k*, because experience has shown that there is no double current, in a contrary sense, in the same metallic circuit. But as soon as the wire *d*, *i*, *e*, *f*, which conducts the current from the battery, is interrupted, the current which belongs to the element *a* will be developed freely in the wire *k*. Examining again the arrangement of the electric wires of the machine (Fig. 1), it will be seen how we manage to make this disposition cause a colored mark on the chemical paper at every interruption of the current of the telegraphic line. It may have been remarked, in Figures 1 and 2, that there are some blue lines drawn of which we have not spoken. The copper wires represented by these lines can have no influence on the operation of the machine, Fig. 1, which we have described, because these lines have no continued communication with the battery D; but observing Fig. 2, we see that these blue lines represent there an identical arrangement of metallic wires with those observed in Fig. 10; the current in fact, starting from the negative pole of the battery D, arrives at the button 3, and by the wire *t*, *t*, to the lever a^1, a^1, and passing by the spring c^1 to the wire colored blue, joins the other spring p^1, p^1, which when the pendulum is in motion comes in contact with the piece of brass n^1; thence the same current continues its course through the wire g^1, b^1, enters the red wire at the point b^1, and comes out at the wire of the line y, y^1, y^{11}, and traversing the machine of the other station, it comes

back through the earth to the pole *a, a,* of the battery D. The other blue wire, which is attached to the positive pole *a* of the battery, finding itself under the same conditions with the wire *k* of Fig. 10, it will carry no current as long as the current of the line L, L^1, can develope itself freely; but every time that this current of the line is interrupted, a colored point will appear on the chemical paper, which is stretched on the cylinder *m*; and as this interruption of the line is renewed at every succeeding line or mark which the point *r* finds on the despatch (Fig. 2), it is clear that by an infinite number of colored prints we shall have on the chemical paper the exact copy of the writing or drawing which has been placed on the other machine.

The description so far given of the effects of the telegraphic machines refers to the oscillations of the pendulums when these are moving from right to left, that is to say, in the direction of the red arrow, drawn near the iron rod o, o^1, o^{11}, Fig. 1. But what will happen in the contrary oscillations which are in the direction of the black arrow? Observing the triple lever a^1, a^{11}, a^1, (which is moveable at the point s^1), placed in each of the machines at the summit of the marble column K, K^1, it is easy to see that its position must change at every oscillation of the pendulum, which pushes it to the right or left with the piece i^{11}, which is of ivory, or some other insulating substance (see notes 4 and 6). Now it happens that when the oscillation of the pendulum is from left to right, the wires conducting the electric current take the arrangement in machine Fig. 1 (which we see also drawn in Fig. 2), and *vice versâ.* To see how the change of electrical communication renders the pantographic telegraph capable of transmitting and receiving dispatches at the same time, it is sufficient to observe attentively the construction of the car *g, g,* shewn separately at Fig. 6. Its base *o, o,* is of bronze, and runs with very little friction on the triangular rail o^1, o^1. At the point *c* is fastened the double lever *n, n,* which by means of two steel pins n^1, n^1, placed at right angles at its extremity, can raise or lower the piece *i, s, m,* and its equal *c, a, s,* placed on the other end of the car. This change takes place every time the car, pushed by the pendulum, strikes the pin *z.* In Fig. 1 we see the two pins *z, z,* destined to produce this effect at every oscillation of the pendulum. Now it is easy to understand that when the car goes from right to left, the point *r* runs over the paper of the cylinder *m*; but when instead the movement is from left to right, the point *r* remains raised from the paper, and the other point *s* rubs over the other paper placed on the other cylinder m^1, Fig. 5. The spoole communicates the motion to this cylinder. On the cylinder m^1, Fig. 5, is placed the paper on which the despatch which is to be sent is written;

the other cylinder carries the chemical paper. In the corresponding machine, Fig. 2, this arrangement is inverted. From this explanation it will be evident how the pantographic telegraph can receive and transmit a message at the same time.

To complete this description of the pantographic telegraph, nothing remains but to prove the truth asserted at the beginning, (that is to say,) that the rapidity which can be obtained in the transmission of despatches augments on account of the dimensions which can be given to the machine. The model which we have described having a pendulum of the length of about a metre, and making in its oscillations an angle of twenty-three degrees with the vertical, traversing with its extremity an arc whose cord is about eighty centimetres in length; supposing we quadruple the dimensions of the machine, the pendulum which would be four metres in length, and also taking the same angle of twenty-three degrees, its lower part would move over about three hundred and twenty centimetres in two seconds, and the page of writing which we should obtain in a given time would thus be doubled. It is evident that this speed of transmission would be greatly increased by the use of stenographic writing.

The capabilities possessed by the pantographic telegraph may be briefly stated as follows:—

First, it provides of an exceedingly rapid transmission of the fac-simile of every kind of characters and drawings.

Second, telegraphic velocity may be further accelerated by the use of stenography.

Third, despatches can be sent and received contemporaneously.

Fourth, the extension of the despatch to be sent in a certain time can be enlarged if the dimension of the telegraphic machine be augmented.

Fifth, the telegraphic characters come out in prussian blue on common white paper.

Sixth, the work of the machines may be continuous, providing the original despatches are passed to the transmitting cylinder one after the other.

Seventh, the current of the telegraphic line is not directly employed in producing the characters and drawings; but these and the mechanical motion of the machines are produced by local piles, which facilitates the employ of greater force with less cost.

NOTES.

1. This interrupter is represented separately in Fig. 9. On the wooden base *a*, *a*, is rivetted at *i* the brass lever *i*, *e*. The electric current coming

from the wire *i, i,* crosses the said lever, and comes out at the wire e, e^1. We can interrupt the current by removing the lever *i, e,* from the button *m.*

2. This mechanism is drawn larger in Fig. 4. The piece *n, n,* is hollow, and can slide in the piece *a, a,* which presses one or the other spring m, m^1. This piece is arched, and its centre coincides with the point of suspension of the pendulum in the column K, K^1. The movement of the same piece *a, a,* is produced by the pendulum, which in its oscillations presses it in the points g, g^1, with the brass tongue *s*, Fig. 3, which is in metallic communication with the copper wire which magnetizes the electro-magnet *d.*

3. Fig. 7 represents the mechanism by which the lever *i** (Fig. 1) closes the circuit of the telegraphic current at every oscillation of the pendulums. This lever *i** is jointed to the rod of the pendulum at the point *p*, and carries at its extremity the platinum rivet *n*, which on nearing the pendulum runs on a species of small bridge *m, m,* rivetted at the point *s* on a piece of ivory. When the pendulum has completed its oscillation, the rivet *n* falls on the platinum piece *o*, and in this way closes the circuit of the current of the line, which neutralizes, as we have seen, the dismagnetism of the electro-magnet *d*, Fig. 1.

4. This piece of ivory *i, i,* is seen sideways in Fig. 3.

5. To enable this secondary current to acquire sufficient force, we can add to the direct current the small coil r^1, of very fine copper or brass wire.

6. Experience has shown that the fac-similes on the telegraphic despatches are more exact and clearer when the force of the current of the line exceeds by some degrees that of the element *a* of the battery D.

7. The course of this current, conducted by the blue wire across the cylinder *m*, is made clear by the mere inspection of the Drawing.

Having now set forth the nature of my correspondent's Invention, and explained the manner of carrying the same into effect, I wish it to be understood that I do not claim as any part of this Invention the principle of employing pendulums for transmitting electric currents, as that is well known; neither do I claim the apparatus for presenting the message and the receiving paper to the traversing or tracter points, as arrangements of this kind are now in use, and it has been preferred to substitute the rotating cylinders for the metal frame referred to in the Provisional Specification as carrying the paper, because the tracter points will then always move in the same plane; nor do I claim the employment of metallized paper or of a non-conducting writing fluid, as these are at present well known; but what I claim under the above in part recited Letters Patent is,—

First, the general arrangement of mechanism as above described for transmitting fac-simile copies of writings and drawings.

And particularly I claim the use of the oscillating pendulum provided with an electro-magnet, as described, by the action of which perfect synchronism between distant pendulums is ensured.

And I also claim the mode of obtaining the message in color, as explained.

In witness whereof, I, the said Alfred Vincent Newton, have hereunto set my hand and seal, the Tenth day of May, in the year of our Lord One thousand eight hundred and fifty-six.

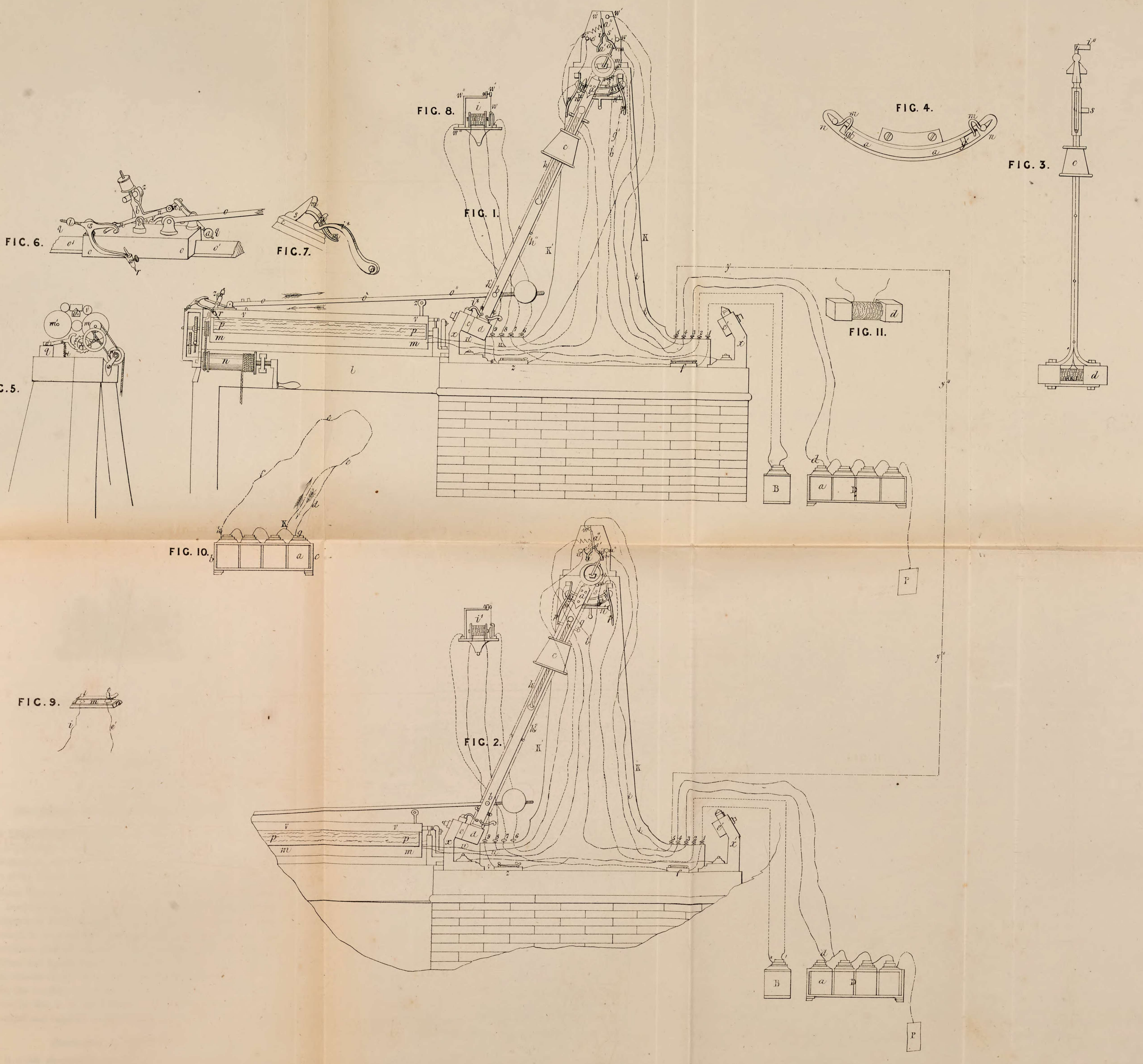
A. V. NEWTON. (L.S.)

Witness,
J. W. MOFFATT,
66, Chancery Lane.

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1856.

A. D. 1855. Nov. 10. No 2532.
NEWTON'S SPECIFICATION.

(1 SHEET)



The filed drawing is partly colored.

Drawn on Stone by Malby & Sons.

LONDON: Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE, Printers to the Queen's most Excellent Majesty. 1856.